federal register

Monday
August 11, 1980

Part X

Environmental Protection Agency

1981 Model Year Carbon Monoxide Emission Standard for Light-Duty Motor Vehicles and Applications for Waiver of Effective Date

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 86

[FRL 1557-7]

Revised Motor Vehicle Exhaust Emission Standards for Carbon Monoxide (CO) for 1981 Model Year Light-Duty Vehicles

AGENCY: Environmental Protection Agency.

ACTION: Final rule.

SUMMARY: This regulation establishes CO emission standards for 1981 model year light-duty vehicles belonging to certain engine families for which I have granted waivers from the standard otherwise applicable under section 202(b)(5) of the Clean Air Act, 42 U.S.C. § 7521(b)(5).

EFFECTIVE DATE: August 11, 1980.

ADDRESS: Information relevant to this rule is contained in Public Docket EN-80-9 at the Central Docket Section of the Environmental Protection Agency (EPA), Gallery I, 401 M Street, S.W., Washington, D.C. 20460 and is available for review between the hours of 8:00 a.m. and 4:00 p.m. As provided in 40 CFR Part 2, a reasonable fee may be charged for copying services.

FOR FURTHER INFORMATION CONTACT: Alex Varela, Manufacturers Operations Division (EN-340), U.S. Environmental Protection Agency, 401 M Street, S.W., Washington, D.C. 20460, (202) 472-9421.

SUPPLEMENTARY INFORMATION: Section 202(b)(1)(A) of the Clean Air Act ("the Act"), 42 U.S.C. 7521(b)(1)(A), requires that regulations applicable to CO emissions from light-duty vehicles or engines manufactured during or after the 1981 model year shall contain, unless waived pursuant to section 202(b)(5), 42 U.S.C. 7521(b)(5), standards which require a reduction of at least 90 percent from CO emission levels allowable under the 1970 model year standards. Regulations implementing this requirement have established a CO standard, often referred to as the statutory standard for CO, of 3.4 grams per vehicle mile (gpm).

Section 202(b)(5) of the Act authorizes the Administrator, on application of any manufacturer, to waive the statutory CO standard for the 1981 and 1982 model years for any light-duty vehicle model for which the Administrator can make certain findings. In these cases, the Act requires that I promulgate substitute CO standards for 1981 and 1982 model year light-duty vehicles as discussed below. The application for a waiver considered here was submitted by Ford Motor Company (Ford). The statutory criteria for the granting of such waivers, my determinations regarding the criteria with respect to the vehicle models covered by Ford's waiver application, and my decision to grant the waiver applications, appear in the consolidated decision issued along with this rule and published elsewhere in this issue of the Federal Register. In that consolidated decision, I granted a waiver covering the following vehicle model (engine family for purposes of that decision) for the 1981 model year only:

Manufacturer	Engine family
Ford Motor Company	2.3 liter turbocharged.

Once I have decided to grant a waiver application for any 1981 model year vehicle model, the Act requires that I simultaneously promulgate regulations adopting emission standards not permitting CO emissions from 1981 model year vehicles of this Ford model to exceed 7.0 gpm. Moreover, the Act further requires that I promulgate regulations establishing these standards not later than 60 days after I receive the waiver application in question. This rule becomes effective immediately upon publication to avoid the possibility of forcing Ford to delay introducing this 1981 model year vehicle model into commerce because it must wait to receive certification of this model until this rule becomes effective.

The public has been afforded an opportunity to comment on the waiver applications at issue, and I have considered those comments in making the consolidated decision which requires the promulgation of this amended rule. For these reasons, I find that providing further notice and opportunity to comment before final promulgation of any of the amendments contained in this rulemaking would be impracticable and unnecessary.

Note.—The Environmental Protection Agency has determined that this document does not contain a major proposal requiring preparation of a regulatory analysis under Executive Orders 11821 and 12044 and OMB Circular A-107.

In addition, because the decision accompanying this rulemaking already is based on a detailed analysis indicating that this rulemaking will have a negligible effect on air quality, the Environmental Protection Agency has not prepared an Environmental Impact Statement to accompany this rulemaking as well.

Dated: July 31, 1980

Douglas M. Costle,

Administrator.

40 CFR 86.081-8(a)(1)(ii) is revised to read as follows:

§ 86.081-8 Emissions standards for 1981 light-duty vehicles.

(a)(1) * * *

(ii) Carbon monoxide—3.4 grams per vehicle mile (2.11 grams per vehicle kilometer), except that carbon monoxide emissions from light-duty vehicles of the following 1981 model year engine families shall not exceed 7.0 grams per vehicle mile (4.35 grams per vehicle kilometer):

Manufacturer	Engine family
American Motors Corporation	151 CID.
	258 CID.
BL Cars, Ltd.	215 CID.
	326 CID.
Chrysler Corporation	1.7 liter
	2.2 liter
	2.6 liter
	3.7 liter
	5.2 liter/2-V.
	5.2 liter/4-V.
Ford Motor Company	1.3 liter.
	1.6 liter/2V overhead camshaft.
	2.3 liter turbocharged
General Motors Corporation	1.6 liter
	2.8 liter/173 CID-2V.
	3.8 liter/231 CID-2V.
	3.8 liter/231 CID-4V. turbocharged
Lotus Cars, Ltd.	2.0 liter.
Toyo Kogyo Co., Ltd.	91 CID.
	120 CID.
Toyota Motor Company, Ltd.	88.6 CID.

* * * * *

(Section 202 and 301(a) of the Clean Air Act, as amended, 42 U.S.C. 7521 and 7501(a))

[FR Doc. 80-24077 Filed 8-8-80; 8:45 am]

BILLING CODE 6560-01-M

ENVIRONMENTAL PROTECTION AGENCY

[FRL 1557-8]

Applications for Waiver of Effective Date of the 1981 Model Year Carbon Monoxide Emission Standard for Light-Duty Motor Vehicles—Eighth Consolidated Decision of the Administrator.

I. Introduction

This is the eighth consolidated decision I have issued under Section 202(b)(5) of the Clean Air Act, as amended (Act), 42 U.S.C. 7521(b)(5), regarding applications from automobile manufacturers for waiver of the 3.4 grams per vehicle mile (gpm) carbon monoxide (CO) emission standard scheduled to apply to 1981 and 1982 model year light-duty motor vehicles and engines.[1]

As the introductions to the previous consolidated decisions explain, section 202(b)(1)(A) of the amended Act establishes a schedule for implementing standards applicable to CO emissions for 1977 and later model year light-duty motor vehicles and engines.[2] The 1977 amendments to the Act, however, included a new provision allowing the Administrator of the Environmental Protection Agency (EPA), under certain limited conditions, to delay for up to two model years implementation of the statutory 3.4 gpm CO standard scheduled to take effect for the 1981 model year.[3] However, these amendments require the Administrator to promulgate interim standards in such cases which do not permit CO emissions over 7.0 gpm.[4]

In response to waiver applications received prior to the one under consideration, EPA held five sets of public hearings and issued seven consolidated decisions pursuant to section 202(b)(5)(A).[5] In those decisions, I denied waivers for certain engine families either because I determined that effective control technology[6] was available contrary to the requirement of section 202(b)(5)(C)(iii) of the Act or because the applicants failed to provide sufficient information to establish that effective control technology was not available. Furthermore, the applicants failed to establish that considerations of costs, driveability, or fuel economy gave me a basis for reaching a different conclusion. I granted the waiver applications covering the remaining engine families after determining for each of those families that the requisite technology was not available, considering costs, driveability, and fuel economy, and that each application met all of the remaining statutory criteria for receiving a waiver.

On May 5, 1980, EPA received a waiver application from Ford.[7] EPA held a hearing on this application on May 8, 1980.[8]

This decision will address the waiver request from Ford on the basis of information from Ford and from other sources.[9]

II. Summary of Decision

I am granting Ford's waiver request for its 2.3 liter (L) turbocharged engine family for the 1981 model year. I am denying the waiver request by Ford covering its 2.3L turbocharged engine family for the 1982 model year. I have based my determinations for each of those model years primarily upon whether Ford established that effective emissions control technology, considering costs, driveability, and fuel economy, is not available to enable the engine family in question to meet the 3.4 gpm statutory CO standard in those model years. In reaching those determinations, I have balanced the risks that Ford and the public would face of incurring adverse consequences if I were to deny Ford's waiver request, based on an incorrect projection that effective emissions control technology is available for Ford's engine family, against the benefits achieved from denying the waiver request, on the basis of a correct conclusion that such technology is available.[10]

I have concluded that the waiver application covering the Ford 2.3L turbocharged engine family meets each of the statutory criteria for receiving a waiver for the 1981 model year. I am therefore prescribing an interim CO emission standard of 7.0 gpm for the 1981 model year for this engine family.

Ford failed to establish that effective emissions control technology is unavailable to enable vehicles scheduled to employ this engine family to meet the statutory CO standard by the 1982 model year. Instead, the information in the record at this time indicates that technology capable of meeting the 3.4 gpm CO emission standard may be available for Ford's 2.3L turbocharged engine family for the 1982 model year.

Considerations of costs, driveability, or fuel economy, whether viewed separately or cumulatively, do not give me a basis for altering my determinations regarding the availability of technology for this engine family for the 1982 model year.

While this engine family may meet some, or all, of the remaining statutory criteria for receiving a waiver for the 1982 model year, my determinations regarding available technology, considering costs, driveability, and fuel economy, preclude me from granting

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[1] The preceding decisions were published as follows: 44 FR 53376 (September 13, 1979); 44 FR 69417 (December 3, 1979); 45 FR 7122 (January 31, 1980); 45 FR 17914 (March 19, 1980); 45 FR 37360 (June 2, 1980); 45 FR 40030 (June 12, 1980); — FR —— (signed July 15, 1980).

[2] Regulations were promulgated on August 24, 1978, setting a CO standard of 3.4 gpm for 1981 and later model year vehicles. 40 CFR 86.081-8(a)(1)(ii). This standard represents at least a 90 percent reduction in CO emissions from the CO standard applicable to 1970 model year vehicles.

[3] Section 202(b)(5)(C) of the Act provides, in part:

The Administrator may grant such waiver if he finds that protection of the public health does not require attainment of such 90 percent reduction for carbon monoxide for the model years to which such waiver applies in the case of such vehicles and engines and if he determines that—

(i) such waiver is essential to the public interest or the public health and welfare of the United States;

(ii) all good faith efforts have been made to meet the standards established by this subsection;

(iii) the applicant has established that effective control technology, processes, operating methods, or other alternatives are not available or have not been available with respect to the model in question for a sufficient period of time to achieve compliance prior to the effective date of such standards, taking into consideration costs, driveability, and fuel economy; and

(iv) studies and investigations of the National Academy of Sciences conducted pursuant to subsection (c) and other information available to him has not indicated that technology, processes, or other alternatives are available (within the meaning of clause (iii)) to meet such standards.

[4] As noted in previous decisions, Section 202(b)(5) of the Act requires that I make a separate assessment for each vehicle model covered by a waiver request. See, e.g., 44 FR 53376 (September 13, 1979), 44 FR 69416 (December 3, 1979), 45 FR 7122 (January 31, 1980). Thus, these earlier consolidated decisions generally have included separate decisions for individual engine families. As in the previous decisions, I have distinguished among engine families primarily on the basis of engine displacement. See note 17, second consolidated decision, 44 FR 69418 (December 3, 1979).

[5] EPA has included testimony received at these five hearings, as well as all other information considered in deciding these five groups of waiver applications, in EPA Public Dockets EN-79-4, EN-79-17, EN-79-19 (for the first through fourth decisions) and EN-80-1 (for the fifth and sixth decisions).

[6] As was the case in the earlier consolidated decisions, I am using the term "technology" in this decision to encompass the statutory language "technology, processes, operating methods, or other alternatives" included as part of section 202(b)(5)(C)(iii) of the Act.

[7] Ford Motor Company.

[8] The transcript from this hearing is located in EPA Public Docket EN-80-9. This decision uses the following abbreviations:

F. App.—Ford Application for CO Waiver, dated May 5, 1980, for its 2.3L turbocharged engine family.

[9] See the discussion on my considerations of other sources of information in the previous waiver decisions, e.g., section III(B)(1)(C), 44 FR 69416, 69422 (December 3, 1979).

[10] See, e.g., 45 FR 17914 (March 19, 1980).

waivers covering this engine family for the 1982 model year. The 3.4 gmp CO statutory standard will therefore remain in effect for the Ford 2.3L turbocharged engine family for the 1982 model year.

III. Discussion

A. Availability of Technology

The decision I have made here on whether to grant or deny a requested waiver turn primarily on whether technology is available to enable an engine family covered by one of these waiver applications to meet the 3.4 gpm CO standard in the 1981 and 1982 model years. Section 202(b)(5)(C)(iii) of the Act expressly assigns an applicant the task of establishing that effective CO control technology is not available, taking into consideration costs, driveability, and fuel economy. Even if the Administrator determines that an applicant has met this burden, section 202(b)(5)(C)(iv) requires the Administrator to consider whether National Academy of Sciences (NAS) studies or other information indicate that technology is available considering costs, driveability, and fuel economy, before granting a waiver request.

As part of my assessment of available technology here, I have considered the results of NAS studies and investigations[11] conducted under section 202(c) of the Act regarding available technology, processes, or other alternatives. The findings of the available NAS studies do not contradict my assessment regarding the availability of technology for Ford's 2.3L turbocharged engine family discussed below.[12]

To support contentions that effective control technology is not available, Ford has provided both descriptions of the systems it has been considering in trying to attain the 3.4 gpm CO emission standard and the results of emission tests performed on vehicles for the purpose of receiving certification for the 1980 and 1981 model years. I have reviewed this information, as well as other information available to me, in reaching my decisions regarding availability of the requisite technology, considering cost, driveability and fuel economy.[13]

Ford applied for a waiver for its 2.3L turbocharged engine family for the 1981 and 1982 model years. In support of this application, Ford provided some emission test data and other information regarding alternative emissions control systems. Ford contended that (1) effective emission control technology was not available to enable this engine family to meet a 3.4 gpm CO standard for the 1981 and 1982 model year; (2) lead-time problems prevented the introduction of alternative emissions control systems or components until the 1983 model year; [14] and (3) Ford and the public would suffer adverse economic consequences if Ford were unable to market this model.[15] Specifically, Ford claims that unanticipated problems primarily caused by catalyst degradation associated with the higher exhaust gas temperature typical of turbocharged engines [16] prevent this engine family from certifying under the 1981 statutory emission standards for the 50,000-mile statutory period.[17]

1. Emission Control Capability of Ford's Turbocharger Technology

My evaluation of the technological capability of the 2.3L turbocharged Ford engine family used the same modified Monte Carlo statistical simulation employed in evaluating the engine families in my fifth, sixth, and seventh consolidated decisions [18] to project, on the basis of data from partially completed prototype vehicle emission testing over extended mileage for the purpose of receiving a Federal certificate of conformity, the likelihood that this engine family will be capable of meeting Federal emission standards when fully tested. In addition, my evaluation included consideration of certification data from vehicles which employ both the turbocharged and naturally aspirated version of this engine and which entered into the mandatory 50,000-mile certification testing procedure. On the basis of my evaluation of those available emission data, I have concluded that this engine family using the turbocharger technology does not demonstrate the capability of meeting the 3.4 gpm CO emission standard for the 1981 model year.[19]

2. Availability of Alternative Technology

The record indicated that Ford's 2.3L, 3.3L, and 4.2L naturally-aspirated engines can meet the 3.4 CO emission standard and would be available for use in the same vehicle models scheduled to employ Ford's 2.3L turbocharged engine.[20] Ford projected, however, that only about 75 percent of prospective purchasers of its turbocharger vehicles would be likely to switch to purchasing one of these naturally-aspirated alternatives were Ford not able to market the turbocharged family engine.[21] Ford contended that the turbocharged engine achieved the better fuel economy values of a smaller displacement engine while still retaining the better performance capabilities of a larger displacement engine.[22]

In *International Harvester Co. v. Ruckelshaus* [23] the United States Court of Appeals for the District of Columbia Circuit reviewed the decision of EPA's Administrator to deny a set of applications for a one-year suspension of the statutory 1975 model year light-duty motor vehicle emission standards, which included the 3.4 gpm CO standards. The statutory criteria for the decision at that time were substantially similar to the criteria now provided in section 202(b)(5)(C) of the Act.[24]

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[11] Report by the Committee on Motor Vehicle Emissions of the National Academy of Sciences, dated November 1974. See also discussions of the applicability of NAS studies in previous CO waiver decisions, e.g., 44 FR at 53376, 53386 (September 13, 1979) and 44 FR at 69416, 69423, 69428 (December 3, 1979). See also, Report of Motor Vehicles Committee, National Academy of Sciences, June 1980.

[12] See, e.g., 44 FR 53376, 53386 (September 13, 1979), 44 FR 69416, 69428 (December 3, 1979). I have had a limited opportunity to study the latest NAS report issued in June 1980. However, I find that the conclusions reached in this report give me no reason to alter my findings regarding the availability of technology as required under sections 202(b)(5)(C)(iii) and 202(b)(5)(C)(iv) of the Act. The report states that the requisite technology is available for much of the industry's planned production for the 1981 model year, but confirms that this might not be the case for all engine families. This conclusion is consistent with my present and previous waiver determinations regarding available technology and is consistent with the previous NAS report.

[13] Much of this information was gathered for and included in the docket for the previous consolidated CO waiver decisions. See EPA Public Dockets EN-79-4, EN-79-17, EN-79-9 and EN-80-1. Those dockets have been incorporated by reference into the docket for this eighth consolidated decision, EPA Public Docket EN-80-9.

[14] May 8, 1980 Transcript, pp. 128-129. Ford app., section V.

[15] Ford supplemental submission, May 16, 1980, p. 2.

[16] May 8, 1980 Transcript, pp. 127-128, 130. Ford supplemental submission May 16, 1980, p. 2.

[17] 42 U.S.C. § 7521(d)(1)(1975).

[18] 45 FR 37360 (June 2, 1980). 45 FR 40030 (June 12, 1980). —FR— (announced on July 15, 1980).

[19] Ford criticized the use of the modified Monte Carlo technique in this decision. Ford supplemental submission, June 13, 1980. However, even under the modified Monte Carlo analysis the 2.3L turbocharged engine family does not demonstrate the capacity of meeting the 3.4 gpm CO standard. App. A, section V. See also 45 FR 40030, 40033 (June 12, 1980).

[20] May 8, 1980 Transcript, pp. 121-122, 124.

[21] Ford supplemental submission, May 16, 1980, p. 2.

[22] Ford supplemental submission, May 16, 1980, pp. 2-3.

[23] 487 F.2d 615 (D.C. Cir. 1973).

[24] The version of the act in effect at that time did not explicitly require the Administrator to assess the effect of the suspension on public health or to take into consideration costs, driveability and fuel economy in evaluating available technology. Moreover, that version required the Administrator to make a separate suspension decision for each applicant manufacturer, rather than to make decisions on a model-by-model basis as the current section 202(b)(5) requires. See Clean Air Amendments of 1970, Pub. L. 91-604, section 6, 81 Stat. 499 (1970) (42 U.S.C. 7521).

Among other things, the Court stated that in deciding on a suspension request the administrator should balance the risks associated with erroneously granting a suspension request against the risks of erroneously denying a suspension request based on an erroneous conclusion that effective control technology is available. The Court indicated that the risk balance should take into account the economic costs (such as the impacts on jobs and the economy) possibly associated with an erroneous denial [25] versus the possible environmental benefits lost through an erroneous grant.

In addition, the Court indicated that the costs of an erroneous denial which the Administrator should consider should include the costs from a denial which is only partially accurate.[26] Under the current section 202(b)(5) of the Act, the gravity of the economic and other risks which both a waiver applicant and the public face from the possibility of an erroneous denial depends on the following two factors: (1) The likelihood that the denial, in fact, will turn out to be either erroneous or only partially accurate and (2) the severity of the adverse economic consequences which could occur as the result of an erroneous partially accurate or denial.[27]

If I were to determine that the Ford 2.3L, 3.3L, and 4.3L naturally aspirated engines constituted available alternative technology, my decision denying a waiver for the 2.3L turbocharged model might be only partially accurate. Ford has indicated that it would expect to be able to market vehicles with these alternative engines (without the turbocharger model's combined characteristics) to only about 75 percent of its prospective customers.[28]

Moreover there is also a risk that a significant number of potential 2.3L turbocharged engine customers who still purchase Ford vehicles will purchase models using larger displacement engines with significantly lower relative fuel economy levels in order to obtain the other characteristics which the 2.3L turbocharged model exhibits.[29] Section 202(b)(5)(C)(iii) of the Act requires that I take into consideration fuel economy in determining the availability of alternative technology.

I have considered information provided by Ford and other information included in the public record in determining the possible risks to Ford and the public in denying a waiver for the 2.3 turbocharged engine family.

I have determined that the lost sales potentially resulting from denying Ford's waiver request would likely result in additional layoffs and unemployment for Ford employees and others. At this time Ford already has serious unemployment problems [30] and any sales lost as a result of the denial of a waiver for this model would only increase the burdens on Ford, its employees, and on the public, that such unemployment creates.

Ford has now suffered such serious economic problems that the economic situation of its North American operations is approaching a dangerous state.[31] The additional lost sales and profits from even a small volume model under current market conditions would only contribute further to deterioration in Ford's potential ability to market vehicles using the engines in question and, in conjunction with other circumstances, could set in motion a series of adverse events which might affect Ford's viability as a manufacturer.[32] If Ford's viability is ultimately threatened, even greater adverse impacts on employment, Ford's suppliers, and the national economy could result.[33]

Aside from those adverse economic consequences which Ford and the public may experience if Ford has to substitute vehicles with other engines for the 2.3L turbocharged model, there is a risk of some adverse consequences for the public in the area of fuel economy. Specifically, sales of alternative Ford engine models would likely include a substantial number of the larger, less fuel-efficient alternative engines [34] at a time when energy conservation is an important national concern recognized by Congress.[35]

3. *Balancing the Risks of Erroneous or Partially Accurate Denial Against the Benefits of a Correct Denial*

The *International Harvester* decision requires that I balance the risk of adverse consequences posed by an erroneous waiver denial against the potential benefits lost by an erroneous grant.

The adverse effect on air quality from granting a waiver for Ford's 2.3L turbocharged model is insignificant. Ford's projected 1981 sales for this model account for less than 0.3% of total 1981 U.S. automobile sales. [36] In addition, the air quality effect of granting waivers to other engine families, if any, which may incur adverse risks and potential benefits comparable to those of the Ford 2.3L turbocharged model from a waiver denial also are quite likely to be insignificant.

Neither (1) the likelihood of sales losses and sales of less fuel-efficient cars, nor (2) the potentially significant impact of these kinds of sales results on employment, suppliers, or fuel economy, under currently prevailing economic and market conditions, would be sufficient by themselves to justify my granting this Ford waiver request. The presence of both of these factors, however, relative to the limited environmental benefits which a waiver denial under these circumstances [37] would achieve, compels me to determine that Ford has met its burden in establishing that alternative technology is not adequately available for its 2.3L turbocharged model for the 1981 model year, considering costs, driveability, and fuel economy.

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[25] These impacts could arise under a denial based on an erroneous conclusion that effective control technology is available, because a manufacturer in fact would not be able to produce a certain vehicle model to meet Federal emission requirements and therefore could lose a substantial portion of its sales.

[26] 478 F.2d at 641

[27] *Cf. Ethyl Corp. v. Environmental Protection Agency*, 541 F.2d 1, 18 (D.C. Cir. 1976) (stating that the administrator's finding under section 211 of the Act that lead particulates "will endanger the public health and welfare" is composed of reciprocal elements of probability and severity).

[28] Ford supplemental submission, May 16, 1980, p. 2.

[29] Although official EPA fuel economy data are not yet available for the 2.3L turbocharged model and potential substitute engine models, Ford claimed a possible 4% fuel economy benefit for the 2.3L turbocharged engine over the 2.3L naturally-aspirated engine. Ford supplemental submission, May 16, 1980, attachment V. In addition, preliminary EPA certification test data support the presence of a 10% fuel economy improvement that a smaller displacement turbocharged engine would be expected to achieve with respect to a similar performance (larger displacement) naturally-aspirated engine. App. A, section VIII, table VIII–1.

[30] May 8, 1980 Transcript, p. 121. See also "Ford Plans White Collar Layoffs Again," *Washington Post*, June 18, 1980, p. D–10.

[31] See, .eg., "Ford Had Deficit of $163.6 Million For First Quarter," *Wall Street Journal*, April 29, 1980, p. 2. See also Ford Motor Company, First Quarter Report, Spring, 1980.

[32] See "U.S. Study Sees Hard Times for Ford," Jake Kelderman, *Automotive News*, July 14, 1980, pp. 2, 6 (citing unpublished Economic Policy Group paper).

[33] Id.

[34] May 8, 1980 Transcript, pp. 121–122, 124.

[35] Congress directed EPA to take fuel economy into consideration in evaluating the availability of technology. Section 202(b)(5)(B)(iii). See also, e.g., section 502 of the Energy Policy Conservation Act, Pub. L. No. 94–163, 89 Stat. 871 (1975).

[36] Ford, opening statement, May 8, 1980 public hearing, p. 1.

[37] I need not determine at this time whether continuing to grant waivers covering any further engine families which have a comparable balance between adverse risks and potential benefits associated with them would or would not eventually result in a significant impact on air quality. Granting a waiver for this Ford model would increase the coverage of waivers granted to less than 30% of all scheduled 1981 U.S. automobile sales.

Ford did not provide sufficient information to establish that effective emissions control technology would not be available for the 1982 model year, considering cost, driveability, and fuel economy, to enable its 2.3L turbocharged engine family to meet the 3.4 gpm CO emission standard. Additional technological features for solving Ford's CO control problems are still available for Ford to evaluate and implement for Ford's turbocharged engine family in the 1982 model year.[38] Ford has not supplied sufficient information on these features to demonstrate their effect on emissions, costs, driveability or fuel economy with respect to the 2.3L turbocharged engine family.

B. *Protection of Public Health*

Section 202(b)(5)(C) of the Act requires that before I grant a waiver covering a given engine family, I must find that protection of the public health does not require attainment of a 3.4 gpm CO standard by the vehicles of the engine family receiving the waiver. Thus, I have examined this issue with respect to Ford's 2.3L turbocharged engine family for which I have determined that effective control technology, considering costs, driveability, and fuel economy, is not available in model year 1981.

I have found as a result of this examination that any adverse health effects resulting from waiving the 3.4 standard for these 1981 model year engine families would be insignificant. The same statement is true regarding the combined health effects resulting from waiving the 3.4 standard for the 1981 model year for these engine families and for all the 1981 and 1982 model year engine families receiving waivers under the previous consolidated CO waiver decisions. As a result, protection of the public health does not require attainment of the 3.4 gpm CO standard by the Ford 2.3L turbocharged engine family, for which I have determined that effective control technology is not available for the 1981 model year.[39]

According to the express terms of the statute, there is no need for me to determine whether waiver applications covering engine families for which the applicant failed to establish the unavailability of effective control technology (considering cost, driveability, and fuel economy) meet any of the remaining statutory criteria in order for me to deny an application.[40] The Act requires me to deny waiver applications where an applicant has failed to meet any one of the criteria regardless of whether such applicant could meet the remaining criteria. Nevertheless, I will address these issues briefly in the course of discussing the remaining criteria regarding this engine family in the 1982 model year as I did in the six previous waiver decisions.

While waiving the 1981 and 1982 statutory CO standards for the engine family here would not significantly affect the public health, noticeable increases in ambient CO levels could result from granting waivers industry-wide.[41] In light of the fact that industry-wide waivers would not be protective of the public health, it is reasonable to grant waivers covering only that portion of the industry consisting of those model year engine families for which I have determined that effective control technology, considering costs, driveability, and fuel economy, is not available (presuming these families also meet the remaining statutory criteria).[42]

C. *Essential to the Public Interest or to the Public Health and Welfare*

Before I may grant a waiver request, section 202(b)(5)(C)(i) of the Act requires that I determine that granting the waiver is essential to the public interest or the public health and welfare.[43]

My assessment of the risks associated with an erroneous or partially-accurate waiver denial indicates the public interest considerations at stake in this waiver decision. I have determined that the adverse economic consequences that could occur due to the real possibility that denying the waiver request for Ford's 2.3L turbocharged engine family might be only partially accurate, in light of the insignificant environmental impact involved, make it essential to the public interest that I grant this waiver request.[44]

I have determined that it is not essential to the public interest or to the public health and welfare to grant a waiver to the Ford 2.3L turbocharged engine family for the 1982 model year, because the applicant has failed to establish that the vehicles in question, using this engine family, are incapable of meeting a 3.4 gpm CO standard or are likely to incur significant costs (or driveability or fuel economy penalties) in meeting that standard for the model year in question. The public's interest in continuously maintaining a diversified and competitive automotive industry for the United States market is not adversely affected by my decision to deny waivers for engine families for which manufacturers have failed to establish the unavailability of adequate lead time to employ effective emissions control technology.[45]

D. Good Faith

In order for me to grant a waiver to any applicant, section 202(b)(5)(C)(ii) of the Act requires that I determine that the applicant in question has made all good faith efforts to meet the established emission standards. As a result, I have examined information regarding Ford's previous and projected efforts toward meeting a 3.4 gpm CO emission standard for the engine family in question.

Ford has provided engineering and technical information to support the contention that it has acted in good faith in trying to meet the 3.4 gpm CO standard. In general, information in the record provides support for determining that Ford has met the Act's good faith criterion in developing emission control technology to enable its 2.3L turbocharged engine family to meet the 3.4 gpm CO standard.[46]

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[38] Appendix A, section IX. Some of the vehicles on which Ford most recently has begun certification testing also may indicate a capability of meeting the 3.4 gpm CO standard. Ford may also reapply for a waiver for the 1982 model year if it is unable to develop effective technology to meet the 3.4 gpm standard for that model year.

[39] See, e.g., discussion of ambient air quality effects, App. B, 44 FR 53376, 53402, 53407 (September 13, 1979) and 44 FR 69416, 69456–69462 (December 3, 1979). The engine families receiving waivers under my previous CO waiver decisions constitute less than 30% of the total projected 1981 model year light-duty vehicle sales in the United States. Ford projected sales of only about 30,000 units of this model in the 1981 model year. May 8, 1980 Transcript, p. 119.

[40] These remaining criteria are found in section 202(b)(5)(C) of the Act. For discussion regarding these criteria in earlier waiver decisions, see e.g., 44 FR 53378 (September 13, 1979); 44 FR 69416, 69420 (December 3, 1979); and 45 FR 7122, 7126 (January 31, 1980).

[41] See the first decision, 44 FR 53376, 53381 and Appendix B at 44 FR 53402–53407 (September 13, 1979).

[42] See, e.g. 44 FR 53376, 53382, 53386–53387 (September 13, 1980).

[43] See sections in previous decisions discussing public health and welfare effects of engine families denied waivers, 44 FR 53387, 44 FR 69429 (Sept. 13, 1979 and December 3, 1979, respectively).

[44] Although Ford has not completed certification durability testing for the 2.3L turbocharged at either a 3.4 gpm or 7.0 gpm CO emission standard, granting this waiver request will significantly increase the likelihood that Ford will be able to successfully certify and produce this engine family under a 7.0 gpm standard. App. A, section V. May 8, 1980 Transcript, pp. 123, 125–127.

[45] Appendix A, sections V, IX. Ford stated that granting this waiver request would permit the additional accumulation of field experience and continuous market experience with this technology because Ford plans to employ it in vehicles produced in 1983 and following model years. Ford has already gained some field experience with turbocharger technology in previous model years.

[46] Although Ford did not provide information regarding preproduction development vehicles, it did provide information which established that Ford had developed and employed relatively sophisticated emission control technology on certification durability test vehicles of this engine family. App. A, section V. May 8, 1980 Transcript, p. 124.

In the absence of any evidence supporting a contrary conclusion, I am unable to determine other than that Ford has met the good faith criterion with respect to the engine family under consideration in this decision.

IV. Conclusion

The Ford engine family for which I determined that effective CO control technology is not available for the 1981 model year is covered by a waiver application which meets each of the remaining criteria under section 202(b)(5)(C) of the Act. As a result, I am granting a waiver of the effective date of the statutory CO emission standard for the Ford 2.3L turbocharged engine family for the 1981 model year.

I have determined that for Ford's 2.3L turbocharged engine family Ford has failed to establish that effective control technology indeed is available to meet a 3.4 gpm CO standard by the 1982 model year, even after considering costs, driveability and fuel economy. Thus, even though Ford's waiver application may meet one or more of the remaining criteria for receiving waivers, I nevertheless must deny the waiver applications covering the Ford 2.3L turbocharged engine family for the 1982 model year.

V. Interim CO Exhaust Emission Standards

As required by section 202(b)(5)(A) of the Act, I am simultaneously promulgating regulations elsewhere in this issue of the **Federal Register** prescribing an interim CO emission standard of 7.0 gpm for 1981 model year vehicles for the engine family receiving a waiver. For this engine family, this action continues in effect for one additional year the CO emission standard applicable to all 1980 model year light-duty vehicles.

Dated: July 31, 1980.

Douglas M. Costle,

Administrator.

Appendix A.—Summary of Technological Capability

Contents

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I. Introduction

The exhaust emission standards for 1981 and later model year light-duty vehicles are currently 0.41 gram per mile HC, 3.4 grams per mile CO, and 1.0 gram per mile NO_x. Section 202(b)(5)(A) of the Clean Air Act, as amended, 42 U.S.C. 7521(b)(5)(A) provides the opportunity for manufacturers to request a waiver of the 3.4 grams per mile CO standard to 7.0 grams per mile during model years 1981 and 1982.

The applicant being considered in this document is Ford. This is the fifth group of CO waiver applications that have been considered by EPA, and the second time a request has been considered from Ford.

This appendix deals with the technological capability of Ford to meet the 1981 and 1982 CO standard of 3.4 grams per mile. This appendix relies on three previous technical appendixes, particularly for explanation of the basic concepts of the standard Monte Carlo simulation utilized in this analysis. These appendixes are:

1. Appendix B, Technical Appendix, to the Decision of the Administrator on Remand for the United States Court of Appeals for the District of Columbia Circuit, April 11, 1973.

2. Appendix A, Technical Appendix, to the Decision of the Administrator In re: Applications for Suspension of 1976 Motor Vehicle Exhaust Emission Standards, July 30, 1973.

3. Appendix A, Technical Appendix, to the Decision of the Administrator In re: Applications for Suspension of 1977 Motor Vehicle Exhaust Emission Standards, March 5, 1975.

This appendix relies on reference 11 for discussion of the Modified Monte Carlo simulation used in this appendix. As indicated in Section 202(b)(5)(C)(iii) of the Clean Air Act, the technological feasibility determination is based on the consideration of technological capability, cost, driveability, and fuel economy. This appendix contains discussion of each of the above topics.

II. Summary of Technological Capability

Table II–1 summarizes the capability of the applicant manufacturer to meet the 1981 and 1982 emission standards. The standards considered in these tables are 0.41 HC, 3.4 CO, 1.0 NO_x.

A guide to the summary tables is as follows. The first column lists engine displacement. The "as received" column refers to the emission data submitted by the manufacturer. "Improvements" refer to the projected technological improvements (factors) applied to the data submitted by the manufacturer.

The "no data" category is an abbreviated notation for the lack of acceptable data to perform EPA's established technological analysis as referred to in EPA's published CO waiver guidelines. The applicants have known for about six years what sort of data is necessary for EPA to make a determination under its established methodology whether or not a given vehicle would be projected to pass or fail a set of standards. Unfortunately, in some cases there was a lack of useable data for vehicles using specific engines. This effectively precluded EPA from making a pass/fail determination for those vehicles through the established methodology. In these cases the vehicles using these engines are called "no data" and no pass/fail determination was made.

Table II–1.—*Applicant: Ford*

Engine	Pass as received	Pass with improvement
2.3L–TC–2V	No for Model Year 1981. No data for Model Year 1982.	N/A.*

* N/A means not applicable or that no hardware improvement factors were applied to these vehicles.

III. Statistical Treatment of the Data

The standard Monte Carlo methodology has been used for the analysis of prototype durability vehicles in this appendix. No changes have been made in the standard Monte Carlo methodology since its last use in a technical appendix. This methodology, which is the foundation for the Modified Monte Carlo methodology for certification vehicles has been discussed in three previous technical appendixes:

1. Appendix B, Technical Appendix, to the Decision of the Administrator on Remand for the United States Court of Appeals for the District of Columbia Circuit, April 11, 1973.

2. Appendix A, Technical Appendix, to the Decision of the Administrator In re: Applications for Suspension of 1976 Motor Vehicle Exhaust Emission Standards, July 30, 1973.

3. Appendix A, Technical Appendix, to the Decision of the Administrator In re: Applications for Suspension of 1977 Motor Vehicle Exhaust Emission Standards, March 5, 1975.

A Modified Monte Carlo simulation has been developed and also utilized in this appendix for actual 1981 model year certification durability vehicles which have accumulated less than 50,000 miles of durability. The Modified Monte Carlo has been discussed in reference 11 as found in Section X of this document.

IV. Factors

With respect to the vehicle emission data submitted by the manufacturers for EPA analysis, vehicles are often run and tested over durability mileage

accumulation schedules without using the best technology that is available to the manufacturer for certification in the 1981 or 1982 model years. There are many reasons why this occurs. First, such technology may have simply not been available in quantity when fleets of vehicles began mileage accumulation.

Second, all vehicles submitted for EPA staff analysis may not have been specifically designed for the 1981 and 1982 Federal emission standards. Also, the manufacturer may wish to maintain some technologies (with known durability) in reserve if their low mileage testing indicates that such technology may not be needed for compliance with the target emission standards. In addition, technology may not appear on durability vehicles because the manufacturer has made a decision that the technology would be too costly for production vehicles.

Factors which have previously been developed, but generally not used in the following analysis include factors for:

- Warm up catalysts for 3W catalyst or 3W+OC systems
- Deletion of power enrichment
- Use of insulated or dual-walled exhaust pipes
- Use of exhaust port liners
- Use of throttle body fuel injection
- Use of multiple point fuel injection

Although the deletion of power enrichment was considered feasible for 1981, factors for this improvement were not used. Use of the other items was not considered possible for most manufacturers for most engine families before the 1982 model year. Therefore, through these additional techniques, the manufacturers may have some additional cushion for certification.

No factors were used for emission control system improvements for vehicles in this analysis. Developmental data were not provided by Ford; therefore, no data was available for developing hardware improvement factors for 1982.

V. Discussion of Individual Manufacturer's Technical Capability

This section will discuss all vehicles which (1) were submitted by the applicant and (2) also are acceptable for input into either the standard Monte Carlo simulation or the Modified Monte Carlo analysis for certification vehicles.

Details of the pass/fail determinations in section II are presented here. To pass the 1981 and 1982 emission standard of 0.41 HC, 3.4 CO, 1.0 NOx, the probabilities of passing each individual pollutant must be greater than or equal to 80% in either the standard or Modified Monte Carlo. If the probability of passing only HC, for example, is less than or equal to 79%, the vehicle is projected to fail—even if the probabilities of passing the CO and NOx standards greatly exceed the 80% cut point.

Ford Motor Company (Ford)

This is the second group of CO waiver applications received from Ford. In their current application Ford has requested a CO waiver from 3.4 to 7.0 grams/mile for their vehicles using 2.3 liter turbocharged (TC) engines with two barrel (2V) carburetors for 1981 and 1982. In their previous application, they requested waivers for vehicles using their new 1.3 liter and 1.6 liter engines for 1981 and 1982. They were granted CO waivers to 7.0 CO for vehicles using the 1.3 liter and 1.6 liter engines for 1981.

No prototype 1981 durability vehicles using 2.3 liter-TC engines were durability tested by Ford prior to their waiver application. Six vehicles have been run to date in the 1981 certification process by Ford. Five of the vehicles are shown in Table V–1. The sixth vehicle (VIN 1B1–2.3–013) was mentioned by Ford at the CO waiver hearing; however, no emission data were presented for it [1 at 133]*. The vehicle results would not change the pass/fail determination anyway since it was terminated with less than 15,000 miles [3].

Two of the certification vehicles (1B1–2.3–098 and 1B1–2.3–104) were not analyzed in the Modified Monte Carlo because they had not accumulated sufficient mileage.

Three vehicles were analyzed in the Modified Monte Carlo analysis for 1981 model year certification vehicles. As shown in table V–2, all three vehicles failed. Not a single vehicle is projected to pass even an individual pollutant.

In summary, vehicles using the 2.3 liter turbocharged–2V engine are projected to fail in the 1981 model year. All vehicles which have gone into the certification process have been terminated with less than 50,000 miles of durability. So Ford must start some new durability vehicles to certify in 1981, regardless of the outcome of their waiver application. Ford has indicated that the major changes which will be made to their eight future durability vehicles to reduce deterioration of exhaust emissions are reductions in the amount of injected air and reductions in catalyst loading [2 at 3] [3]. The technical staff believes that reductions in catalyst loading may result in cost benefits for Ford with potential increases in emissions deterioration. Data have shown an emissions benefit and improved catalyst efficiency associated with increased precious metals loading [7 at 53391].

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* The Abbreviated notation [W at Y] means reference number W from Section X of this document at page number Y.

Table V-1

Vehicles in the Ford Waiver Application for the 2.3 Liter Turbocharged Engine

Engine	VIN	Emission Control System*	Entered in Modified Monte Carlo?	If Not Entered in Modified Monte Carlo -Why?	Comment	Reference
2.3L-TC-2V	1B1-2.3-096	FBC/AIR/EGR/3W/OC	Yes	——	1981 50-States certification vehicle - now terminated	7 & at Attachment I
2.3L-TC-2V	1B1-2.3-097	FBC/AIR/EGR/3W/OC	Yes	——	1981 50-States certification vehicle-now terminated	7 & at Attachment I
2.3L-TC-2V	1B1-2.3-098	FBC/AIR/EGR/3W/OC	No	Less than 20,000 miles of durability	1981 50-States certification vehicle-now terminated	7 & at Attachment I
2.3-TC-2V	1B1-2.3-104	FBC/AIR/EGR/3W/OC	No	Less than 20,000 miles of durability	1981 50-States certification vehicle-now terminated	7 & at Attachment I
2.3-TC-2V	1B1-2.3-105	FBC/AIR/EGR/3W/OC	Yes	——	1981 50-States certification vehicle-now terminated	7 & at Attachment I

* FBC means feedback carburetor.
AIR means switched air injection using an air pump.
EGR means ported exhaust gas recirculation.
3W means 3-way catalyst.
OC means oxidation catalyst.

Table V-2

Modified Monte Carlo Results of 1981 Ford Certification Durability Vehicles Using 2.3 Liter Turbocharged Engines

VIN	IW/ETW	Certification Engine Family	Probability of Pass HC	CO	NOx	Comment
1B1-2.3-096	3000/3250	2.3BE	14	0	0	Terminated
1B1-2.3-097	3000/3250	2.3BD	0	0	63	Terminated
1B1-2.3-105	3000/3250	2.3BC	0	0	63	Terminated

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The 2.3 liter, naturally aspirated engine is a potential replacement engine for the 2.3 liter turbocharged engine. Other engines, such as six cylinder or eight cylinder engines, could also be used. The naturally aspirated version of the 2.3 liter engine was certified at levels below the 1981 emission standards as long ago as model year 1978. The emission results of the 1978 California certification durability vehicle are shown in table V–3.

Table V–3.—*Final Certification Results of a 1978 Model Year Ford Vehicle Using a 2.3 Liter Naturally Aspirated Engine*

[VIN 8E22.314B8080AXR; Family F2.3B1TR80XR80]

Miles	HC	CO	NOX
4917	0.38	2.5	0.70
9840	0.20	1.2	0.95
14954	0.31	1.4	0.81
19794	0.49	2.0	0.62
24802	0.39	2.3	0.68
29803	0.39	2.3	0.88
29823	0.40	1.9	0.75
34809	0.25	2.9	0.48
39804	0.36	2.1	0.86
44809	0.30	1.8	0.82
49867	0.39	2.0	1.00
4k (calc)	0.34	1.87	0.73
50k (calc)	0.36	2.19	0.82
df	1.06	1.17	1.13

VI. Cost Analysis

The costing methodology used here is essentially the same as that used in the six previous CO waiver decisions [5], [6 at 40030], [7 at 53400], [8 at 69450], [9 at 7133], [10 at 17915]. Responses to the EPA subpoena of August 8, 1979 enabled EPA to revise cost estimates of certain emission control devices, notably monolithic three-way and oxidation catalysts. The subpoena requested prices that suppliers charge the automobile manufacturers for emission control devices or systems.

Described below are estimates of cost to the consumer for compliance with 3.4 vs 7.0 CO (due to lead time problems for certain emission control devices, separate estimates are often necessary for 1981 and 1982). The changes in cost were calculated by individual engine size. These changes are based on the differences in emission control hardware between systems targeted to meet 7.0 CO, as described by each manufacturer in their applications and systems judged capable by EPA of meeting 3.4 CO, based on the Monte Carlo analysis results or successful certification of similar vehicles.

Ford 2.3 Liter Turbocharged Engine

Ford described the 2.3 liter turbocharged engine emission control system as "* * * Ford's best effort system available for the 1981–82 time frame" [2 at 2]. Ford will attempt to certify the same or similar system regardless of whether a waiver is granted and thus no cost differential will exist between the 3.4 and 7.0 g/mi CO standards [2 at 2, 3]. Additionally, at the public hearing Ford stated that the cost of emission control hardware is not an issue in this waiver application [1 at 142].

The vehicle types which Ford is planning to equip with turbocharged 2.3 liter engines are also available with naturally aspirated engines. Four, six or eight cylinder naturally aspirated engines could be substituted for the turbocharged 2.3 liter engine. As previously mentioned in this appendix, the 2.3 liter naturally aspirated engine is certified at the 3.4 g/mi CO standard.

Additionally, the EPA technical staff believes that a turbocharging system may significantly increase the cost of an engine. Therefore, a naturally aspirated engine would probably reduce vehicle costs compared to the turbocharged 2.3 liter engine.

Ford stated at the public hearing, "* * * being able to offer the 2.3 liter turbocharged engine gives us an increment of sales that we otherwise wouldn't have for those vehicles" [1 at 120]. Sales of 2.3 liter turbocharged vehicles was projected to be no more than 30,000 vehicles per model year in model years 1981 and 1982 [1 at 119]. If the turbocharged 2.3 liter engine were unavailable, Ford estimated "* * * that no more than 75% of the projected 2.3 L(T) sales volume could be compensated by sale of vehicles equipped with other engines" [3 at 2]. Based on these Ford estimates, a sales loss of about 15,000 vehicles may be incurred if the turbocharged 2.3 liter engine is unavailable in both model years 1981 and 1982.

The EPA concludes the emission control system cost is not a determining issue in the assessment of this engine's ability to meet a 3.4 g/mi CO standard. However, the unavailability of the turbocharged 2.3 liter engine may reduce vehicle sales.

VII. Driveability

The technological feasibility of meeting the 1981–1982 emission standards is, in part, determined by the applicant's ability to maintain acceptable driveability while attaining these standards.

Ford—Ford maintains that the 2.3 liter turbocharged engine is incapable of meeting the 1981–1982 emission standards. Neither Ford's CO waiver application [2] nor Ford's testimony at the CO Waiver Hearing [1] indicated that a waiver would be necessary to maintain acceptable driveability. No driveability data were submitted for this engine. Presently, driveability is not one of the determining factors in assessing the ability of Ford's 2.3 liter turbocharged engine to comply with a 3.4 g/mi CO standard.

VIII. Fuel Economy

Ford 2.3 Liter Turbocharged Engine

Ford's CO waiver request did not address the fuel economy effect of a 3.4 versus a 7.0 g/mi CO standard on the 2.3 liter turbocharged engine. However, Ford's waiver request stated the following about fuel economy:

"There is general agreement that a fuel economy benefit could be obtained by turbocharging for high specific power output while allowing reductions in engine size which in turn permits reduction in engine friction (e.g., pumping losses) and weight for the given power output." [2 at 2]

Society of Automotive Engineers paper number 790312 was written about Ford's 2.3 liter turbocharged engine. Tables VIII–1, 2 and 3 presented in this appendix are from this SAE report [12 at 23, 24]. These tables compare various aspects of the turbocharged 2.3 liter engine to a naturally aspirated 2.3 liter engine and a naturally aspirated 5.0 liter engine. Although the SAE report did not detail the testing techniques or vehicle configurations which were used to generate the data presented in these tables, the data do appear to be appropriate for comparison purposes. Table VIII–2 indicates that the acceleration performance of the turbocharged 2.3 liter engine is much greater than the naturally aspirated 2.3 liter engine and is nearly equal to the 5.0 liter V–8 engine. Table VIII–3 shows the turbocharged 2.3 liter engine fuel economy to be both approximately 8 percent less than the naturally aspirated 2.3 liter engine economy and nearly 16 percent greater than the 5.0 liter engine fuel economy. Since none of these three vehicles represents a 1981 calibration, these data are presented only for the purpose of a rough comparison.

Ford predicted, at the public hearing, that the turbocharged 2.3 liter engine will have better fuel economy than the naturally aspirated 2.3 liter engine [1 at 122]. This fuel economy differential was projected to be approximately one mile per gallon based on the combined city/highway MPG values [1 at 125].

Ford supplied fuel economy data for several 1979 and 1980 model year vehicles equipped with both turbocharged and naturally aspirated 2.3 liter engines. These data indicate a minimum of one mile per gallon fuel economy penalty for turbocharged

vehicles compared to similar naturally aspirated vehicles [3 at Attachment V].

The EPA technical staff includes that for the 2.3 liter turbocharged engine, compliance with a 3.4 CO standard would have not a deleterious effect on fuel economy in comparison to compliance with a 7.0 standard. Fuel economy is not a critical issue in the determination of the technical feasibility for compliance with the statutory emission standards by the 2.3 liter turbocharged engine, . If the turbocharged engine were unavailable, a naturally aspirated 2.3 liter engine could be substituted and provide approximately equal or greater fuel economy; however, maximum acceleration performance would be decreased. Larger displacement six or eight cylinder engines are also possible substitutes for the turbocharged 2.3 liter engine. These larger engines may have comparable acceleration performance; however, a fuel economy penalty may be incurred.

Table VIII-1.—*Engine Performance*

Engine	Peak power (HP at RPM)	Specific power (HP/Cu. In.)	Peak torque (Lb-Ft at RPM)	Weight (Lb)	Peak HP/Lb
Naturally Aspirated 2.3L I-4	101 @ 4800	.72	124 @ 3500	418	.24
Turbocharged 2.3L I-4	138 @ 5500	.98	148 @ 3500	450	.31
Naturally Aspirated 5.0L V-8	155 @ 3800	.51	256 @ 2500	565	.27

Table VIII-2.—*Vehicle Performance*

Mode	Base 2.3L	Turbo 2.3L	5.0L V-8
0-60 mph	13.7 sec.	9.4 sec.	8.9 sec.
25-60 mph	10.3 sec.	6.7 sec.	6.3 sec.
50-80 mph	16.9 sec.	9.8 sec.	9.0 sec.
0-10 sec.	435 ft.	543 ft.	544 ft.

Table VIII-3.—*Fuel Economy*

	Base 2.3L	Turbo 2.3L	5.0L V-8
Combined mpg avg.	24.0 mpg	22.0 mpg	19.0 mpg

IX. Lead Time Considerations

Ford 2.3 Liter Turbocharged Engine

Ford has not yet successfully completed certification durability testing for a CO standard of either 3.4 CO or 7.0 CO. Regardless of whether the CO standard is waived or not, Ford is planning to start eight additional durability vehicles because all their earlier vehicles have been terminated prior to completion of 50,000 miles [1 at 123].

At the public hearing Ford stated that the lead time implication was the same for either a 3.4 o4 7.0 g/mi CO standard [1 at 124). However, Ford would have greater confidence of successfully certifying at a 7.0 g/mi CO standard [1 at 123].

The eight additional certification durability vehicles which Ford is in the process of starting will complete testing not earlier than late August or early September 1980 [3 at 4]. These vehicles represent Ford's earliest opportunity to certify a durability vehicle for either a 7.0 CO or 3.4 CO standard. No emissions data are available on this group of vehicles. The durability vehicles Ford is starting are similar to previous durability vehicles with the following differences [1 at 125]:

(i) Reduced loading of the light-off catalyst,

(ii) Revised air management strategy with less air,

(iii) Four vehicles will have non-feedback fuel systems.

Naturally aspirated 2.3 liter engines could be substituted for turbocharged 2.3 liter engines [1 at 120]. The naturally aspirated 2.3 liter engine has completed certification at the 1981-1982 emission standards. According to Ford, deletion of the turbocharging system would significantly reduce engine performance [2 at 4]. Ford estimates that no more than 75 per cent of the potential turbocharged 2.3 liter sales volume could be retained by offering vehicles equipped with other engines [3 at 2].

The present first choice emission control system for the turbocharged 2.3 liter engine is described by Ford as the most sophisticated and costly system available to them [4 at 11]. However, Ford stated that the addition of electronic fuel injection (EFI) is required to insure a high confidence of meeting the 1981-1982 standards [1 at 134]. EFI is planned for production in model year 1983, which was reported as the earliest possible introduction time [1 at 143, 146].

The EPA technical staff concurs with Ford that EFI could improve this engine's ability to meet a 3.4 g/mi CO standard. However, insufficient lead time is available for model year 1981 to incorporate major changes, such as EFI, to the 2.3 liter turbocharged engine.

Several possibilities exist to improve the emissions performance in the 1982 model year. The feedback carburetor which Ford is using, a Holley model 6500, allows the primary main metering circuit to be modulated by an external vacuum control signal. The magnitude of this vacuum control signal is a function of the electronic control unit (ECU) input to the vacuum solenoid regulator. Ford stated the poor emission performance of two 1981 durability 2.3 liter turbocharged engines, "* * * is believed to be the result of feedback open loop calibration drift resulting from a shift in vacuum solenoid regulator output with mileage accumulation" [2 at 9]. Additionally, the Holley model 6500 carburetor which Ford is using on the 2.3 liter turbocharged engine does not operate closed-loop at idle [1 at 125].

Holley manufactures another carburetor, model 6510, which could be used on the 2.3 liter turbocharged engine. The model 6510 is similar to the model 6500; however, it incorporates an internal solenoid which modulates both the primary main circuit air/fuel ratio and the idle circuit air/fuel ratio as a function of an electrical signal. Elimination of the vacuum interface between the ECU and the carburetor is a possible advantage of the model 510 compared to the model 6500. Ford stated that the solenoid equipped Holley carburetor (model 6510) was considered; however, it was never tested [1 at 131 to 132].

A turbocharger increases the thermal inertia of both the induction and exhaust systems compared to a similar naturally aspirated engine. Heating the air-fuel mixture promotes vaporization of the fuel and is especially beneficial during the cold start portion of vehicle operation. Ford has incorporated an engine coolant passage in the intake manifold for this purpose. A possible emission benefit could be obtained in the 1982 model year by the addition of an electric resistance heating element to heat the intake air-fuel mixture.

Other possible system improvements which could be incorporated by the 1982 model year include a change from ported to backpressure or sonic EGR, increased rhodium content in the 3-way catalyst, and changes in catalyst location.

In summary, present lead time constraints for the turbocharged 2.3 liter engine are equal for either a 3.4 CO or 7.0 CO standard. All data for model year 1981 indicate the 2.3 liter turbocharged engine is incapable of meeting the statutory standards. However, sufficient lead time is available to incorporate changes which may permit compliance to a 3.4 g/mi CO standard in the 1982 model year.

X. References

1. *Transcript of Proceedings, United States Environmental Protection Agency, Public Hearing: CO Emission Standards Waiver Application,* Washington, DC, May 8, 1980, Acme Reporting Company.

2. *Application for Waiver of 1981 and 1982 Carbon Monoxide Emission Standard for the 2.3L Turbocharged Engine,* Ford Motor Company, May, 1980.

3. Letter and attachments to Mr. Charles N. Freed (EPA) from Ms. Helen G. Petrauskas (Ford) dated May 16, 1980.

4. Opening statement of Ms. Helen Petrauskas (Ford), May 8, 1980.

5. Leroy H. Lindgren, *Cost Estimations for Emission Control Related Component-Systems and Cost Methodology Description,* EPA Pub. #460/3–78–002, March 1978.

6. *Federal Register,* Vol. 45, No. 115, June 12, 1980.

7. *Federal Register,* Vol. 44, No. 179, September 13, 1979.

8. *Federal Register,* Vol. 44, No. 223, December 3, 1979.

9. *Federal Register,* Vol. 45, No. 22, January 31, 1980.

10. *Federal Register,* Vol. 45, No. 55, March 19, 1980.

11. *Federal Register,* Vol. 45, No. 107, June 2, 1980.

12. SAE Paper No. 790312, *"Turbocharging Ford's 2.3 Liter Spark Ignition Engine"* by H. H. Dertian, G. W. Holiday & G. W. Sanburn (Ford Motor Company), February 26–March 2, 1979.

[FR Doc. 80-24078 Filed 8-8-80; 8:45 am]

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